CLAIMS

What is claimed is:

1. A process comprising,

   (a) contacting one of (i) 1,2-dichloro-1,2-difluoroethane (HCFC-132) with a dehalogenating agent, or (ii) 1,1,2-trifluoroethane (HFC-143) with a dehydrofluorinating agent in the liquid phase and a solvent, and

   (b) producing a product mixture comprising E-1,2-difluoroethylene and Z-1,2-difluoroethylene, and at least one additional compound comprising one or more of acetylene, fluoroacetylene, HFO-1141, CFC-113a, HCFO-E-1122a, HCFO-Z-1122a, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCO-1140, HFC-134, and HCFO-1122.

2. The process of claim 1, wherein (i) 1,2-dichloro-1,2-difluoroethane (HCFC-132) contacts a dehalogenating agent comprising a reducing metal, optionally in the presence of an activator; or wherein (ii) 1,1,2-trifluoroethane contacts a dehydrofluorinating agent comprising a base.

3. The process of claim 2, wherein the reducing metal which comprises magnesium, zinc, or cadmium, preferably zinc or cadmium.

4. The process of claim 2 or claim 3, wherein the activator is selected from one of a halogen, bromoalkane, an iodoalkane a vicinal dibromoalkane, a vicinal diiodoalkane, or a vicinal dihalochlorocarbon.

5. The process of claim 4, wherein the activator comprises bromine, iodine, a bromoethane, iodomethane, 1,2-dibromoethane, 1,2-diiodoethane, or 1,2-dibromotetrachloroethane.

6. The process of claim 2, wherein the base comprises one of an alkaline or alkaline earth metal alkoxide, an alkyl lithium, or an alkaline metal amide.

7. The process of claim 6, wherein the base comprises one of an alkaline or alkaline earth metal alkoxide selected from one of lithium methoxide, sodium methoxide, sodium ethoxide, potassium tert-butoxide, sodium isoproxide, or magnesium ethoxide.

8. The process of any one of claims 1 to 7, wherein a portion of the Z-1,2-difluoroethylene in the product mixture is isomerized to E-1,2-difluoroethylene, optionally at a temperature between 600°C and 800°C.

9. The process of any one of claims 1 to 7, wherein a portion of the Z-1,2-difluoroethylene in the product mixture is catalytically isomerized to E-1,2-difluoroethylene.

10. The process of claim 9, wherein the catalytic isomerization is conducted in the vapor phase at a temperature of between 100°C and 500°C, in the presence of a catalyst.

11. The process of claim 9, wherein the catalyst is selected from one of fluorinated or partially fluorinated Al_2O_3, Cr_2O_3, a fluorinated chromium oxide, or a chromium oxyfluoride.

12. A composition, comprising HFO-E-1132, HFO-Z-1132, or a mixture of HFO-E-1132 and HFO-Z-1132, and further comprising one or more additional compounds selected from acetylene, fluoroacetylene, difluoromethane (HFC-32), 1,1,1,2,2-pentafluoroethane (HFC-125), E-1-chloro-1,2-difluoroethylene (HCFO-E-1122a), Z-1-chloro-1,2-difluoroethylene (HCFO-Z-1122a), 1,1,2-trifluoroethylene (HFO-1123), fluoroethylene (HFO-1141), 1-chloro-1,2,2-trifluoroethane (HCFC-133), 1-chloro-1,1,2-trifluoroethane (HCFC-133b), 1,1-dichloro-2,2,2-trifluoroethane (HCFC-123), 1,2-difluoroethane (HFC-152), 1,1,2-trifluoroethane (HFC-143), fluoromethane (HFC-41), chlorodifluoromethane (HCFC-22), ethylene, 1-chloro-1,2-difluoroethane (HCFC-142a), 1,1-difluoroethylene (HFO-1132a), vinyl chloride (HCO-1140), 1-chloro-1-fluoroethene (1131a), E-1-chloro-2-fluoroethene (HCFO-E-1131), Z-1-chloro-2-fluoroethene (HCFO-Z-1131), and 1-chloro-2,2-difluoroethylene (HCFO-1122), wherein, if present, the total amount of acetylene, fluoroacetylene, fluoroethylene and vinyl chloride comprises one of <200 ppm, <100 ppm, <25 ppm, <10 ppm, or 1 ppm or less, and the amount of fluoroethylene comprises one of <200 ppm, <100 ppm, <25 ppm, <10 ppm, or 1 ppm or less, and the respective amounts of acetylene, fluoroacetylene, fluoroethylene and vinyl chloride, if present is selected from at most one of <10 ppm, <1 ppm, <0.1 ppm or <0.01 ppm.

13. The composition of claim 12, wherein a molar ratio of HFO-Z-1132 to HFO-E-1132 comprises 1.1 to at least 9:1.

14. The composition of claim 12 or claim 13, comprising:

(a) at least one additional compound selected from HFC-32, HFC-125, HFC-134, HFO-1123, HCFO-E-1122a, HCFO-Z-1122a, HFO-1141, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCO-1140, and HCFO-1122 and wherein the amount of additional compounds comprise no more than 2 weight percent of the total composition; or

(b) at least one additional compound selected from HFC-32, HFC-125, HFC-134, HFO-1123, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCO-1140, and HCFO-1122 and wherein the amount of additional compounds comprise no more than 2 weight percent of the total composition; or

(c) at least two additional compounds selected from HFC-32, HFC-125, HFC-134, HFO-1123, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCO-1140, and HCFO-1122 and wherein the amount of additional compounds comprise no more than 2 weight percent of the total composition; or

(d) at least three additional compounds selected from HFC-32, HFC-125, HFO-1123, HFC-134, HCFO-1131a, HCFO-E-1131, HCFO-Z-1131, HCO-1140, HFC-134, and HCFO-1122 and wherein the amount of additional compounds comprise no more than 2 weight percent of the total composition.

15. A process comprising,

(a) contacting one of (i) a 1,2-dichloro-1,2-difluoroethane (HCFC-132) feed with a dehalogenating agent, or (ii) a 1,1,2-trifluoroethane (HFC-143) with a dehydrofluorinating agent in the liquid phase and a solvent, and

(b) producing a product mixture comprising E-1,2-difluoroethylene and Z-1,2-difluoroethylene, and at least one additional compound comprising one or more of acetylene, fluoroacetylene, difluoromethane (HFC-32), 1,1,1,2,2-pentafluoroethane (HFC-125), E-1-chloro-1,2-difluoroethylene (HCFO-E-1122a), Z-1-chloro-1,2-difluoroethylene (HCFO-Z-1122a), 1,1,2-trifluoroethylene (HFO-1123), fluoroethylene (HFO-1141), 1-chloro-1,2,2-trifluoroethane (HCFC-133), 1-chloro-1,1,2-trifluoroethane (HCFC-

133b), 1,1-dichloro-2,2,2-trifluoroethane (HCFC-123), 1,2-difluoroethane (HFC-152), 1,1,2-trifluoroethane (HFC-143), fluoromethane (HFC-41), chlorodifluoromethane (HCFC-22), ethylene, 1-chloro-1,2-difluoroethane (HCFC-142a), 1,1-difluoroethylene (HFO-1132a), vinyl chloride (HCO-1140), 1-chloro-1-fluoroethene (HCFO-1131a), E-1-chloro-2-fluoroethene (HCFO-E-1131), Z-1-chloro-2-fluoroethene (HCFO-Z-1131), and 1-chloro-2,2-difluoroethylene (HCFO-1122).

16. The process of any one of claims 1 to 11 or 15, wherein the product mixture comprises HFO-Z-1132 and HFO-E-1132 having a Z/E ratio of from about 1:1 to about 9:1, and wherein the process further comprises:

(a) distilling the product mixture into a first stream and a second stream, wherein the second stream has a Z:E ratio of from about 10:1 to about 100:1; and

(b) isomerizing said second stream to reduce the Z:E ratio to be from about 1:1 to about 10:1.

17. The process of claim 16, wherein the first stream has a Z:E ratio of from about 0.01:1 to about 0.1:1.

18. The process of claim 16 or claim 17, further comprising:

subjecting the isomerized stream of step (b) to distillation.

19. The process of claim 18, wherein the isomerized stream of step (b) is recycled to step (a) for the distillation.